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CHAPTER 4

Sensibility of the upper eyelid skin after upper blepharoplasty: A prospective evaluation study

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Abstract

Background: Although it is commonly assumed that the sensory disturbances that occur in the skin of the upper eyelid after upper blepharoplasty will improve within time, the precise occurrence, the nature and severity, as well as the duration and degree of recovery have not been well documented.

Methods: Perceptions of touch, temperature, pressure and pain were tested by the tip of a cotton ball, a Tip-Therm, a Cochet-Bonnet aesthesiometer and a neurological pin. The tests were performed prior to the upper blepharoplasty and after 1 week, 6 to 8 weeks and 6 months at three or six different places of the upper eyelid skin.

Results: Perception of touch was significantly decreased in the central part of the upper eyelids 1 week and 6 to 8 weeks after upper blepharoplasty. Perceptions of pressure and pain were significantly decreased in the central and nasal lower part of the upper eyelids after 1 week, persisting after 6 to 8 weeks in the central lower part.

Conclusions: One week and 6 to 8 weeks after upper blepharoplasty, the perceptions of touch, pressure and pain were decreased in the central part of the upper eyelid. In the nasal part, the perceptions of pressure and pain were decreased after 1 week, but often were restored after 6 to 8 weeks. Six months after surgery, all modalities of sensibility in the entire upper eyelid skin were restored and comparable with the preoperative situation.

Introduction

Blepharochalasis is a common condition of skin redundancy of the upper eyelids hanging on or even beyond the eyelashes, mostly caused by aging. This condition can easily be treated by an upper blepharoplasty, one of the most commonly performed procedures by plastic surgeons. After upper blepharoplasty, patients regularly notice a diminished sensibility of the upper eyelid skin. Although it is commonly assumed that this loss of sensibility of the upper eyelid skin will improve within time, the precise occurrence of disturbed sensibility after upper blepharoplasty, the kind and seriousness, and the duration and degree of recovery have not been well documented. It would be most advantageous for providing good pre and post surgical information to patients concerning upper blepharoplasty to have an exact idea of the extent of sensibility loss and the period of recovery.
Therefore, this prospective evaluation study was performed to elucidate the prevalence, nature and severity of the sensory disturbances that occur in the skin of the upper eyelid after upper blepharoplasty, as well as the duration and degree of recovery.

Materials and methods

Study design: The study design was a prospective cohort study during 6 months. All patients with blepharochalasis of the upper eyelids who were planned for upper blepharoplasty in the Bergman Clinics Heerenveen in the period between June and September 2012, were asked to participate in this study. The exclusion criteria were a previous operation on the upper eyelids. All blepharoplasties were performed by plastic surgeons working in the Bergman Clinics using a fat-saving upper eyelid blepharoplasty technique[1].

Examination of sensibility: Four modalities of sensibility were tested: perception of touch, temperature, pressure and pain. The tests were performed at three (perceptions of touch and temperature) or six (perceptions of pressure and pain) different places of each upper eyelid, namely laterally, centrally and nasally on the eyelid skin (for the latter two modalities divided into above and below the eyelid crease). All four modalities were tested at four different moments: 1 hour before the operation, 1 week afterwards (after removal of the stitches), 6 to 8 weeks afterwards (when they came for a check-up at the outpatient department) and 6 months after the upper blepharoplasty. The tests were all carried out by the principal investigator (S.M.W.P.) and took place in the clinic (first three measurements) or at home (fourth measurement) and lasted 15 to 20 minutes each time.

Touch. For testing the perception of touch, all three test places were randomly touched three times during 1 second by the tip of a cotton ball (Klinisoft Balls, 0.6 g/pc., Klinion, Medeco BV, Oud-Beijerland, The Netherlands). When noticing touch the patient had to say "yes" and the investigator noted how often the patient noticed a touch (0, 1, 2 or 3 times) in every place.

Temperature. For testing the perception of temperature, all three test places were randomly touched three times during 1 second by the Tip-Therm (Tip-Therm GmbH, Brüggen, Germany). For every contact the patient had to say "warm" or "cold" and the investigator noted how often the patient felt the right temperature (0, 1, 2 or 3 times) in every place.

Pressure. For testing the perception of pressure, all six test places were randomly touched three times during 1 second by a Cochet-Bonnet aesthesiometer (Luneau Ophthalmologie, Visionix, Prunay le Gillon, France) with a filament length of 6.0 centimeter. If the patient verbally responds to the touch 3 of 3 times, the number "6.0" was recorded as the pressure threshold reading for that place and time period. If the patient responded fewer than 3 of 3 times, the filament was shortened by 0.5 cm and the test was repeated. This process was continued, shortening the filament by 0.5 cm each time, until the patient felt the filament touch 3 of 3 times in every place.

Pain. For testing the perception of pain, all six test places were randomly touched three times during 1 second by a glass-headed pin (48x0.80 mm, Prym Consumer Europe GmbH, Stolberg, Germany). For every contact the patient had to say "sharp" or "blunt" and the investigator noted how often the patient felt the right extremity of the pin (0, 1, 2 or 3 times) in every place.

Statistical analysis: The Wilcoxon signed-rank test was used to analyze if differences in number of times that a touch was felt (cotton ball) or named correct (Tip-Therm and pin) as well as differences in pressure thresholds (aesthesiometer) were significant among different moments of testing.

Results

Characteristics: In total 32 patients (64 upper eyelids) were included in this study, 29 women (91%) and three men (9%). Two women terminated the study earlier than planned, after respectively the second and third measurement. The mean age of the participants was 54 years, with a range from 39 to 78 years. The second moment of testing took place 7 days after the operation (in 59% of the participants), within a range of 5 to 8 days. After an average of 8 weeks, ranging from 5 to 14 weeks, the third moment of testing was carried out. Finally the last measurements were performed at approximately 25 weeks, with a range from 18 to 33 weeks. There was an average of 17 weeks between the third and fourth moment of testing, with a minimum of 10 and maximum of 26 weeks.

Perception of touch: Prior to the upper blepharoplasty, touch with a cotton ball was felt 3 out of 3 times by all 32 participants at all three places of the upper eyelids. In the central part of the upper eyelids, 1 week and 6 to 8 weeks after surgery, the number of times that touch with a cotton ball was felt was significant lower as compared to the preoperative situation. Six months after surgery, in all parts of the upper eyelids, the number of times that touch with a cotton ball was

felt was not significantly different as compared to the preoperative situation (**Table 1**).

Table 1. Number of times (0, 1, 2 or 3) that touch with a cotton ball was felt at three different places of the upper eyelids on the different moments of testing.

	Preoperative				After 1 week				After 6-8 weeks				After 6 months			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
Lateral part	0	0	0	64	0	0	1	63	0	0	0	62	0	0	0	60
Central part	0	0	0	64	**4**	**4**	**6**	**50***	**3**	**10**	**6**	**43***	0	0	2	58
Nasal part	0	0	0	64	0	0	3	61	0	0	0	62	0	0	0	60

Wilcoxon signed-rank test. * Significantly lower than preoperative, $p < 0.001$.

Perception of temperature: The number of times that a touch with the Tip-Therm was named correct was not significantly different on the different moments of testing at all three measured places of the upper eyelids.

Perception of pressure: One week after upper blepharoplasty, the mean pressure threshold in the central and nasal lower part of the upper eyelids was significantly lower than in the preoperative situation. After 6 to 8 weeks this was still the case in the central lower part of the upper eyelids. Six months after surgery, the mean pressure thresholds were significantly higher for all six measured places of the upper eyelids as compared to the preoperative situation (**Table 2** and **Figure 1**).

Table 2. Mean pressure threshold at six different places of the upper eyelids on the different moments of testing.

	Preoperative	After 1 week	After 6-8 weeks	After 6 months
Lateral above	5.117	5.055	5.202	**5.558†**
Central above	4.664	**5.141†**	5.024	**5.367†**
Nasal above	5.094	5.258	**5.589†**	**5.667†**
Lateral below	4.219	4.062	**4.863†**	**5.217†**
Central below	3.922	**0.977***	**2.411***	**4.475†**
Nasal below	4.328	**3.242***	4.427	**4.858†**

Wilcoxon signed-rank test

* Significantly lower than preoperative, $p < 0.000$; † Significantly higher than preoperative, $p < 0.000$.

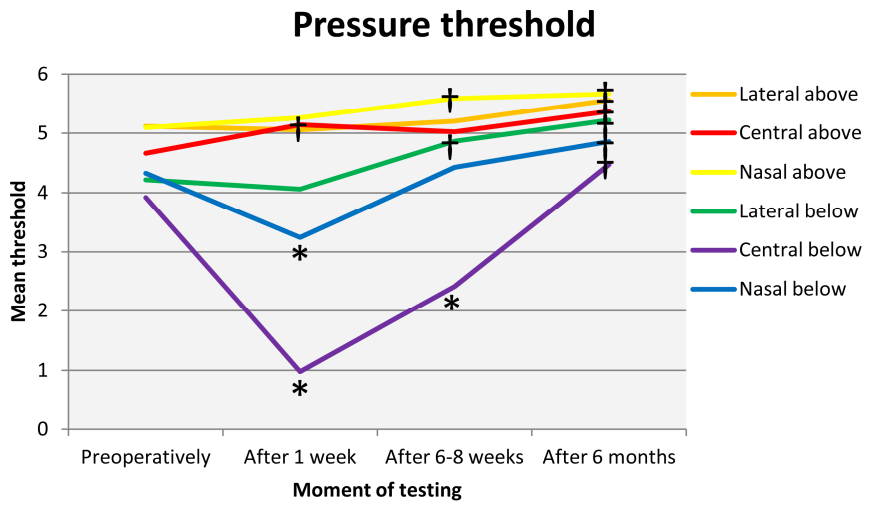

Figure 1. Mean pressure threshold on six different places of the upper eyelid at the different moments of testing. * Significantly lower than preoperative, $p < 0.000$; † Significantly higher than preoperative, $p < 0.000$.

Perception of pain: One week after upper blepharoplasty, in the central and nasal lower part of the upper eyelids, the number of times that touch with a glass-headed pin was named correct was significantly lower as compared to the preoperative situation. After 6 to 8 weeks this was still the case in the central lower part of the upper eyelids. Six months after surgery, in all parts of the upper eyelids, the number of times that touch with a glass-headed pin was named correct was not significantly different as compared to the preoperative situation (**Table 3**).

Table 3. Number of times (0, 1, 2 or 3) that touch with the neurological pin was named correct at six different places of the upper eyelids on the different moments of testing.

	Preoperative				After 1 week				After 6-8 weeks				After 6 months			
	0	1	2	3	0	1	2	3	0	1	2	3	0	1	2	3
Lateral above	0	2	16	46	0	4	12	48	0	7	17	38	0	4	12	44
Central above	0	1	14	49	0	1	16	47	0	2	5	55	0	1	16	43
Nasal above	1	2	10	51	0	1	8	55	0	1	6	55	0	1	11	48
Lateral below	0	3	15	46	0	3	10	51	0	1	12	49	0	2	5	53
Central below	0	2	12	50	**16**	**30**	**9**	**9***	**3**	**27**	**16**	**16***	0	4	13	43
Nasal below	0	2	18	44	**2**	**19**	**23**	**20***	0	2	27	33	0	3	13	44

Wilcoxon signed-rank test. * Significantly lower than preoperative, $p < 0.000$.

Discussion

This study, prospectively evaluating the sensibility of the upper eyelid skin after upper blepharoplasty, clearly demonstrates that sensibility, after a period of decreased perception of touch, pressure and pain in the central part (as measured at 1 week and 6-8 weeks) and decreased perception of pressure and pain in the nasal part (as measured at 1 week), fully recovers in all parts of the upper eyelid skin (as measured after 6 months).

In 2002, Black et al. already demonstrated that the mean pressure threshold of the upper eyelid skin 1 week after upper blepharoplasty was significantly decreased as compared to the preoperative situation.[2] In 64 of 68 eyelids (94%) the perception of pressure was disturbed 4 to 5 millimeter above the eyelashes halfway the medial and lateral canthus. However, because Black et al. did only measure the pressure threshold at one point of the upper eyelid skin, the exact extent of the sensory disturbance of upper eyelid skin after upper blepharoplasty was unknown till this study.

We found that 1 week after surgery the perception of pressure is diminished both centrally as well as in the nasal part of the upper eyelid skin, but remains intact in the lateral part of the upper eyelid. This can be clearly explained anatomically: the skin of the upper eyelid is innervated by multiple nerves, namely laterally by the nervus lacrimalis, centrally by the nervi supratrochlearis and supraorbitalis (branch of the nervus frontalis) and nasally by the nervus infratrochlearis (branch of the nervus nasociliaris).[3,4] Anatomical dissection studies have demonstrated that the vertical orientated structures in the medial half of the upper eyelid are end branches of the nervus supraorbitalis.[5,6] Hence, it is likely that the centrally located nerve braches (nervi supratrochlearis and supraorbitalis) are cut in an upper blepharoplasty procedure, while the nasally and laterally located branches (nervi lacrimalis and infratrochlearis) remain spared. Edema (and thereby increased pressure) which is often present in the upper eyelid skin area for several days to weeks after surgery may explain the fact that the perceptions of pressure and pain are disturbed as well in the nasal part of the upper eyelid skin after 1 week.

Sparing of the lateral sensibility of the upper eyelid (innervated by the nervus lacrimalis) with disruption of the central (and nasal) sensibility, fits with the results of Kim et al. They demonstrated that lacrimation (inter alia, nervus lacrimalis) remains intact after upper blepharoplasty, while corneal sensibility (nervi supratrochlearis, supraorbitalis and infratrochlearis) is reduced significantly.[7]

In view of previous sensibility studies it seems contradictory that in our study the perception of temperature remains intact while other modalities of sensibility become disturbed. E.g. Farah et al. found significantly reduced perceptions of pressure, touch, pain, temperature and vibration in the abdominal skin after abdominoplasty.[8] In addition, Fels et al. found absent perceptions of temperature and pain, combined with a strongly reduced pressure threshold of the abdominal skin in majority of patients after abdominoplasty.[9]

However, because of the relatively large diameter of the Tip-Therm touching a place on the upper eyelid skin (lateral, medial or nasal), may stimulate both the upper as well as the lower part of the upper eyelid. Therefore, our results of the perception of temperature in fact reflect sensibility of the upper part of the upper eyelid, which usually remains spared. On the other hand, Coltro et al. recently found disturbed perception of pressure with intact perception of temperature in the skin of the ear after otoplasty, a result that fits our results.[10]

The remarkable finding that the mean pressure threshold is significantly higher central above the incision 1 week after surgery can be explained by the fact that the preoperative point of measurement has been removed by the excision of the upper blepharoplasty: the mean pressure threshold of the second measurement actual reflects a more cranial part of the upper eyelid skin. The significantly higher pressure thresholds 6 month after surgery could be explained by a learning curve of the participants. Besides that, it may be possible that the condition of blepharochalasis (stretched skin hanging on the upper eyelids) causes a reduced pressure threshold of the upper eyelid skin so that the perception of pressure improves after upper blepharoplasty.

Conclusions

Our prospective evaluation study concerning sensibility of upper eyelid skin has clearly demonstrated that 1 week and 6 to 8 weeks after upper blepharoplasty the perceptions of touch, pressure and pain are decreased in the central part of the upper eyelid. In the lateral part the perceptions of touch, temperature, pressure and pain remains undisturbed. In the nasal part the perceptions of pressure and pain are decreased 1 week after upper blepharoplasty, but often are restored after 6 to 8 weeks. At this place, as well as laterally, the perceptions of touch and temperature remain unaffected after surgery. Six months after upper blepharoplasty the perceptions of touch, temperature, pressure and pain are fully restored in all parts of the upper eyelid skin. As such, this information can now be used by (oculo)plastic surgeons to adequately inform patients what to expect about upper eyelid sensibility after upper blepharoplasty.

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